What is Claimed is:

1. An automated batch aerosol method for making particles of a selected composition, the method comprising:

batch processing of a batch of precursor liquid, comprising a liquid vehicle and a precursor material, to manufacture a batch of particulate product, the batch processing including batch initiation operations, batch termination operations and intermediate operations, the intermediate operations occurring between the batch initiation operations and the batch termination operations;

the intermediate operations comprising:

(a) generating an aerosol stream, in an ultrasonic aerosol generator including a plurality of activated ultrasonic transducers, from a carrier gas and the precursor liquid, the aerosol stream including droplets comprising the precursor liquid dispersed in aerosol form in the carrier gas, the aerosol generator including at least one inlet receiving precursor liquid feed to the aerosol generator;

(b) supplying the carrier gas to the aerosol generator from a carrier gas supply system in fluid communication with the aerosol generator;

(c) supplying the precursor liquid feed from a precursor liquid supply system in fluid communication with the aerosol generator; and

(d) forming the particles in the aerosol stream, comprising heating the aerosol stream in an aerosol heater in fluid communication with the aerosol generator;

prior to commencement of the batch initiation operations and after completion of the batch termination operations, the aerosol stream not being generated;

the batch initiation operations comprising commencing generation of the aerosol stream and the batch termination operations comprising ceasing generation of the aerosol stream; and

at least one operation during the batch initiation operations, the intermediate operations and the batch termination operations being automatically controlled at the direction of an electronic processor processing instructions for manufacture of the particles of the selected composition.

2. The method of Claim 1, wherein the batch initiation operations comprise activating the ultrasonic transducers.

3. The method of Claim 2, wherein the step of activating the ultrasonic transducers comprises automatically activating, at the direction of the electronic processor, the ultrasonic transducers.

4. The method of Claim 2, wherein a flow path for the aerosol stream comprises the aerosol generator and the aerosol heater; and

the batch initiation operations comprise automatically pressure testing the flow path for leaks prior to activating the ultrasonic transducers, the pressure testing being controlled at the direction of the electronic processor.

5. The method of Claim 4, wherein the flow path further comprises an aerosol cooler downstream from the aerosol heater.

6. The method of Claim 5, wherein the flow path further comprises a particle collector downstream of the aerosol cooler.

7. The method of Claim 2, wherein the batch initiation operations comprise, prior to the step of activating the ultrasonic transducers, automatically commencing, at the direction of the electronic processor, to supply the precursor liquid feed to the aerosol generator.

8. The method of Claim 7, wherein the batch initiation operations comprise, after the step of commencing to supply the precursor liquid feed and prior to the step of activating the ultrasonic transducers, establishing circulation of the precursor liquid from the precursor liquid supply system to the aerosol generator, through the aerosol generator and back to the precursor liquid system.

9. The method of Claim 8, wherein the step of establishing circulation comprises automatically heating, at the direction of the electronic processor, at least a portion of the circulating precursor liquid, to raise the temperature of at least a portion of the aerosol generator.

10. The method of Claim 9, wherein the heating is automatically discontinued, at the direction of the electronic processor, after the temperature of the circulating precursor liquid has risen above a predetermined level.

11. The method of Claim 2, wherein the batch initiation operations comprise, prior to the step of activating of the ultrasonic transducers, automatically increasing, at the direction of the electronic processor, temperature within the aerosol heater.

12. The method of Claim 11, wherein the aerosol heater comprises at least two end caps, a first said end cap adjacent a flow entrance into the aerosol heater and a second said end cap adjacent a flow exit from the aerosol heater, the step of increasing the temperature within the aerosol heater comprising cooling, at the direction of the electronic processor, at least one of the first and second end caps.

13. The method of Claim 11, wherein the aerosol heater comprises a furnace having a plurality of heating zones and, during the step of increasing the temperature within the aerosol, heat input into each of the heating zones being automatically independently controlled at the direction of the electronic processor.

14. The method of Claim 11, wherein a flow path for the aerosol stream comprises the aerosol generator and the aerosol heater; and

the batch initiation operations comprise, after the step of increasing the temperature within the aerosol heater and prior to the step of activating the ultrasonic transducers, automatically pressure testing the aerosol flow path for leaks, the pressure testing being controlled at the direction of the electronic processor.

15. The method of Claim 2, wherein the batch initiation operations comprise, prior to the step of activating the ultrasonic transducers, automatically commencing, at the direction of the electronic processor, to supply the carrier gas to the aerosol generator.

16. The method of Claim 15, wherein the batch initiation operations comprise, after the step of commencing to supply the carrier gas to the aerosol generator and prior to the step of activating the ultrasonic transducers, flowing the carrier gas through a flow path for the aerosol stream, the flow path including the aerosol generator and the aerosol heater.

17. The method of Claim 16, wherein the aerosol heater is at an elevated temperature during the step of flowing the carrier gas through the flow path, so that the carrier gas is heated as it flows through the aerosol heater.

18. The method of Claim 17, wherein the flow path includes an aerosol cooler located downstream of the aerosol heater.

19. The method of Claim 18, wherein the batch initiation operations comprise, prior to the step of activating the ultrasonic transducers, automatically commencing, at the direction of the electronic processor, to supply a cooling gas to the aerosol cooler; and

the cooling gas mixing with the carrier gas during the step of flowing the carrier gas through the flow path, so that the cooling gas cools the carrier gas.

20. The method of Claim 18, wherein the flow path includes a particle collector downstream of the aerosol cooler, heat from the carrier gas heating at least a portion of the particle collector as the carrier gas flows through the particle collector.

21. The method of Claim 2, wherein the batch initiation operations comprise, prior to the step of activating the ultrasonic transducers, preparing the batch of precursor liquid, the preparation of the batch of precursor liquid including adding the precursor material and the liquid vehicle to a vessel, the vessel being a part of the precursor liquid supply system; and

at least one of the addition of the precursor material and the addition of the liquid vehicle occurring automatically at the direction of the electronic processor.

22. The method of Claim 21, wherein both the addition of the precursor material and the addition of the liquid vehicle occur automatically at the direction of the electronic processor.

23. The method of Claim 21, wherein the addition of the precursor material is from a hopper automatically actuated at the direction of the electronic processor.

24. The method of Claim 21, wherein the addition of the liquid vehicle is via a flow control valve that is automatically actuated at the direction of the electronic processor.

25. The method of Claim 21, wherein the liquid vehicle and the precursor material, in the vessel, are automatically agitated, at the direction of the electronic processor, to mix the liquid vehicle and the precursor material.

26. The method of Claim 21, wherein the liquid vehicle comprises deionized water.

27. The method of Claim 21, wherein, during the preparation of the batch of precursor liquid, the precursor material dissolves in the liquid vehicle.

28. The method of Claim 21, wherein, during the preparation of the batch of precursor liquid, the precursor material is dispersed as a disperse phase suspended in a continuous phase of the liquid vehicle.

29. The method of Claim 21, wherein the precursor material is a first precursor material and the precursor liquid further comprises a second precursor material, both the first and second precursor materials being added to the vessel during the preparation of the precursor liquid.

30. The method of Claim 1, wherein the intermediate operations comprise automatic control, at the direction of the electronic processor, of flow of the carrier gas supplied to the aerosol generator from the carrier gas supply system.

31. The method of Claim 30, wherein the carrier gas supply system comprises a plurality of gas supply lines, each delivering a porion of the carrier gas to the aerosol generator, flow of the carrier gas through each said gas supply line being independently automatically controlled at the direction of the electronic processor.

32. The method of Claim 30, wherein the control of the flow of the carrier gas supplied to the aerosol generator comprises automatic actuation, at the direction of the electronic processor, of at least one flow control valve through which at least a portion of the carrier gas flows.

33. The method of Claim 1, wherein the intermediate operations comprise automatic control, at the direction of the electronic processor, of flow of the precursor liquid feed supplied to the aerosol generator from the liquid supply system.

34. The method of Claim 33, wherein the control of the flow of the precursor liquid feed comprises automatic actuation, at the direction of the electronic processor, of at least one flow control valve through which at least a portion of the precursor liquid flows.

35. The method of Claim 1, wherein the liquid supply system comprises at least two vessels, each containing at least a portion of the precursor liquid during the intermediate operations;

during the intermediate operations precursor liquid in a first vessel is transferred to a second vessel; and

precursor liquid in the second vessel is transferred to the aerosol generator as at least a part of the precursor liquid feed to the aerosol generator.

36. The method of Claim 35, wherein the transfer of the precursor liquid from the first vessel to the second vessel is automatically controlled at the direction of the electronic processor.

37. The method of Claim 36, wherein the electronic processor automatically monitors the level of the precursor liquid in the second vessel and automatically directs control of the transfer of the precursor liquid from the first vessel to the second vessel as a function of, at least in part, the monitored level.

38. The method of Claim 35, wherein, during the intermediate operations, a first portion of the precursor liquid feed exits the aerosol generator in droplets of the aerosol stream and a second portion of the precursor liquid feed exits the aerosol generator as a precursor liquid effluent, at least a portion of the precursor liquid effluent being received in the second vessel for recirculation to the aerosol generator as at least a part of the precursor liquid feed.

39. The method of Claim 35 wherein the transfer of the precursor liquid from the second vessel to the aerosol generator is automatically controlled at the direction of the electronic processor.

40. The method of Claim 35, wherein the intermediate operations comprise adding additional liquid vehicle to the second vessel to control the concentration, in the second vessel,

of the precursor material in the precursor liquid, the addition of the additional liquid vehicle being automatically controlled at the direction of the electronic processor.

41. The method of Claim 40, wherein the electronic processor automatically monitors at least one property of the precursor liquid in the second vessel and automatically directs control of the addition of the additional liquid vehicle as a function, at least in part, of the at least the one monitored property.

42. The method of Claim 40, wherein the electronic processor automatically monitors at least one property of the precursor liquid in the precursor liquid feed stream and automatically directs control of the addition of the additional liquid vehicle as a function, at least in part, of the at least one monitored property.

43. The method of Claim 1, wherein the intermediate operations comprise circulating, during the step of generating an aerosol stream, a cooling fluid through the aerosol generator to cool the ultrasonic transducers, flow of the cooling fluid being automatically controlled at the direction of the electronic processor.

44. The method of Claim 1, wherein, during the intermediate operations, the activated ultrasonic transducers are driven by electronic drivers, with the electronic drivers being automatically cooled at the direction of the electronic processor.

45. The method of Claim 1, wherein the intermediate operations comprise automatic control, at the direction of the electronic processor, of heat input into the aerosol heater.

46. The method of Claim 45, wherein the aerosol heater comprises a furnace having a plurality of heating zones and, during the intermediate operations, heat input into each of the heating zones is automatically independently controlled at the direction of the electronic processor.

47. The method of Claim 46, wherein the plurality of the heating zones includes at least a first heating zone and a second heating zone, which opposes the first heating zone in a direction substantially perpendicular to the direction of flow of the aerosol stream through the furnace; and

for at least a portion of the intermediate operations, the electronic processor directs a higher heat input into the first heating zone than into the second heating zone.

48. The method of Claim 1, wherein the intermediate operations comprise, after the step of heating the aerosol stream, cooling the aerosol stream, comprising adding a cooling gas to the aerosol stream, the addition of the cooling gas to the aerosol stream being automatically controlled at the direction of the electronic processor.

49. The method of Claim 1, wherein the batch termination operations comprise deactivating the ultrasonic transducers.

50. The method of Claim 49, wherein the step of deactivating the ultrasonic transducers comprises automatically deactivating, at the direction of the electronic processor, the ultrasonic transducers.

51. The method of Claim 49, wherein the batch termination operations comprise automatically discontinuing, at the direction of the electronic processor, supply of the precursor liquid feed to the aerosol generator.

52. The method of Claim 51, wherein the step of discontinuing the supply of the precursor liquid feed to the aerosol generator occurs after the step of deactivating the ultrasonic transducers.

53. The method of Claim 51, wherein the precursor liquid supply system includes a vessel from which at least a portion of the precursor liquid feed to the aerosol generator is supplied; and

the electronic processor monitors the level of the precursor liquid in the vessel and automatically directs the discontinuance of the supply of the precursor liquid feed to the aerosol generator when the level in the vessel drops below a predetermined low level.

54. The method of Claim 51, wherein the precursor liquid supply system includes a vessel from which at least a portion of the precursor liquid feed to the aerosol generator is supplied; and

the electronic processor monitors at least one property of the precursor liquid in the vessel and automatically directs the discontinuance of the supply of the precursor liquid feed

to the aerosol generator when the electronic processor determines that the concentration of the precursor material in the precursor liquid in the vessel exceeds a predetermined level, the determination by the electronic processor being a function, at least in part, of the monitored at least one property.

55. The method of Claim 49, wherein the precursor liquid supply system comprises at least two vessels, each containing at least a portion of the precursor liquid during the intermediate operations;

during the intermediate operations, precursor liquid in the first vessel being transferred to the second vessel, and precursor liquid in the second vessel being transferred to the aerosol generator as at least a part of the precursor liquid feed to the aerosol generator; and

during the intermediate operations, the electronic processor monitors the level of the precursor liquid in the first vessel and automatically directs commencement of the batch termination operations after the level in the first vessel drops below a predetermined level.

56. The method of Claim 55, wherein the batch termination operations comprise automatically discontinuing, at the direction of the electronic processor, the transfer of the precursor liquid from the first vessel to the second vessel.

57. The method of Claim 56, wherein the intermediate operations comprise adding at least a portion of the precursor liquid effluent to the second vessel for recirculation to the aerosol generator as part of the precursor liquid feed;

the intermediate operations further comprise automatically adding to the second vessel, at the direction of the electronic processor, additional liquid vehicle to at least partially offset a tendency of the precursor liquid in the second vessel to become more concentrated in the precursor material over time; and

during the batch termination operations, the electronic processor automatically directs addition of the additional liquid vehicle at an accelerated rate relative to the rate of addition during the intermediate operations.

58. The method of Claim 49, wherein the batch termination operations comprise automatically decreasing, at the direction of the electronic processor, the temperature in the aerosol heater.

59. The method of Claim 58, wherein the step of decreasing the temperature in the aerosol heater occurs after the step of deactivating the ultrasonic transducers.

60. The method of Claim 49, wherein the batch termination operations comprise, after the step of deactivating the ultrasonic transducers, automatically purging, at the direction of the electronic processor, at least the aerosol generator and the aerosol heater with the carrier gas.

61. The method of Claim 60, wherein the batch termination operations comprise, after the step of purging, automatically discontinuing, at the direction of the electronic processor, supply of the carrier gas to the aerosol generator.

62. The method of Claim 60, wherein during the step of purging, the electronic processor automatically monitors at least one property of the purging carrier gas at a location downstream from the aerosol generator; and

the purging step is automatically discontinued, at the direction of the electronic processor, after the electronic processor determines, as a function, at least in part, of the at least one monitored property, that purging is substantially complete.

63. The method of Claim 62, wherein the at least one monitored property comprises nitrogen oxide content.

64. The method of Claim 49, wherein, the intermediate operations comprise, after the step of heating the aerosol stream, cooling the aerosol stream, comprising supplying a cooling gas to an aerosol cooler where the cooling gas is mixed into the aerosol stream; and

the batch termination operations comprise automatically discontinuing, at the direction of the electronic processor, the supply of the cooling gas to the aerosol cooler.

65. The method of Claim 64, wherein, the step of discontinuing the supply of the cooling gas occurs after the step of deactivating the ultrasonic transducers.

66. The method of Claim 1, wherein, the batch initiation operations, the intermediate operations, and the batch termination operations each comprise a sequence of steps substantially automatically controlled at the direction of the electronic processor.

67. The method of Claim 1, wherein transitions between the batch initiation operations and the intermediate operations and between the intermediate operations and the batch termination operations are substantially automatically controlled at the direction of the electronic processor.

68. The method of Claim 1, wherein the precursor liquid batch is larger than about 300 liters.

69. The method of Claim 1, wherein, during each of the batch initiation operations, the intermediate operations and the batch termination operations, the electronic processor communicates with a controller, which controller communicates with actuatable process equipment to automatically effectuate process control.

70. The method of Claim 69, wherein the actuatable process equipment comprise at least one flow control valve.

71. The method of Claim 69, wherein the actuatable process equipment comprise at least one pump.

72. The method of Claim 1, wherein the instructions processed by the electronic processor are stored in a computer-readable medium, the computer-readable medium having stored therein different instructions for the manufacture of particles of at least one composition other than the selected composition.

73. The method of Claim 1, wherein the aerosol generator includes at least one outlet for discharging precursor liquid effluent from the aerosol generator, at least a portion of the effluent precursor being recirculated back to the aerosol generator.

74. The method of Claim 1, wherein, during the intermediate operations, the particles are collected from the aerosol stream, and after the collection of the particles, the particles are subjected to a post-collection heat treatment.

75. The method of Claim 74, wherein, during the post-collection heat treatment, chemical reactions occur within the particles to modify the composition of the particles or the crystallinity of the particles is altered.

76. The method of Claim 74, wherein the post-collection heat treatment is conducted in a rotary kiln.

77. An aerosol method for making particles, involving recirculation of a precursor liquid that tends to concentrate over time, the method comprising:

generating, in an aerosol generation facility, an aerosol stream including droplets, comprising a precursor liquid, dispersed in a carrier gas;

the aerosol generation facility including an aerosol generator where the droplets are formed, a carrier gas supply system supplying the carrier gas to the aerosol generator and a precursor liquid supply system supplying the precursor liquid to the aerosol generator, the precursor liquid including a liquid vehicle and a precursor material;

after the generating step, removing at least a portion of the liquid vehicle from the droplets and forming the particles in the aerosol stream;

during the generating step, the precursor liquid supplied to the aerosol generator being separated into at least two portions, a first portion exiting the aerosol generator in the droplets of the aerosol stream and a second portion exiting the aerosol generator as precursor liquid effluent, at least a portion of which is returned to the precursor liquid supply system and recycled to the aerosol generator;

during the generating step, additional liquid vehicle being added to at least one of the carrier gas supply system, the precursor liquid supply system and the aerosol generator, to at least partially compensate for a tendency of the precursor liquid to become more concentrated in the precursor material over time.

78. The method of Claim 77, wherein, during the step of generating the aerosol stream, the concentration of the precursor material in the precursor liquid supplied to the aerosol generator varies by no more than about 20 percent relative to a maximum concentration of the precursor material in the precursor liquid supplied to the aerosol generator.

79. The method of Claim 77, wherein, during the step of generating the aerosol stream, the concentration of the precursor material in the precursor liquid supplied to the aerosol varies by no more than about 10 percent relative to the maximum concentration of the precursor material in the precursor liquid supplied to the aerosol generator.

80. The method of Claim 77, wherein, during the step of generating the aerosol stream, the concentration of the precursor material in the precursor liquid supplied to the aerosol varies by no more than about 5 percent relative to the maximum concentration of the precursor material in the precursor liquid supplied to the aerosol generator.

81. The method of Claim 77, wherein the additional liquid vehicle is added in the form of a vapor to the carrier gas supply system.

82. The method of Claim 81, wherein the liquid vehicle comprises water and adding the additional liquid vehicle to the carrier gas supply system comprises humidifying the carrier gas prior to supplying the carrier gas to the aerosol generator.

83. The method of Claim 81, wherein the step of humidifying the carrier gas comprises heating the carrier gas prior to introducing the carrier gas into the aerosol generator.

84. The method of Claim 77, wherein the additional liquid vehicle is added to the aerosol generator.

85. The method of Claim 77, wherein the additional liquid vehicle is added to the precursor liquid supply system.

86. The method of Claim 77, further comprising automatically monitoring at least one property of the precursor liquid at some location in the aerosol generation facility and automatically controlling the quantity of the additional liquid vehicle being added based, at least in part, on the at least one monitored property.

87. The method of Claim 86, wherein the step of automatically controlling comprises automatically determining a concentration of the precursor material in the precursor liquid at the location and automatically controlling the quantity of the additional liquid vehicle being added based, at least in part, on the determined concentration.

88. The method of Claim 86, wherein the location is within the precursor liquid supply system.

89. The method of Claim 86, wherein the location is within the precursor liquid supply system in a vessel from which the precursor liquid is withdrawn for supply to the aerosol generator or within a stream of the precursor liquid withdrawn from the vessel.

90. The method of Claim 89, wherein the additional liquid vehicle is added to the vessel.

91. The method of Claim 90, further comprising actively mixing the precursor liquid in the supply vessel.

92. The method of Claim 91, wherein the mixing comprises recirculating the precursor liquid contained in the supply vessel, comprising withdrawing a side stream from one portion of the vessel and reintroducing the side stream into a second portion of the vessel.

93. The method of Claim 92, wherein the first portion and the second portion are adjacent opposing ends of the vessel.

94. The method of Claim 93, wherein the first portion is adjacent the bottom of the vessel and the second portion is adjacent the top of the vessel.

95. The method of Claim 87, wherein the step of determining the concentration comprises automatically monitoring, at the location, at least one property of the precursor liquid and, using the at least one measured property, automatically determining the concentration of the precursor material.

96. The method of Claim 95, wherein the at least one property includes density.

97. The method of Claim 89, further comprising automatically monitoring the level of the precursor liquid in the vessel, and automatically controlling the quantity of the additional liquid vehicle being added to the aerosol generation system based, at least in part, on the monitored level.

98. The method of Claim 77, wherein the liquid supply system comprises a first vessel in fluid communication with a second vessel, each of the first and second vessels containing a portion of the precursor liquid, the first vessel supplying the precursor liquid to the second vessel, the second vessel supplying the precursor liquid to the aerosol generator.

99. The method of Claim 98, wherein the second vessel is pressurized and the first vessel is substantially not pressurized.

100. The method of Claim 99, wherein a check valve is located between the first vessel and the second vessel to prevent backflow from the second vessel to the first vessel.

101. The method of Claim 98, wherein the first vessel has a larger capacity than the second vessel.

102. The method of Claim 98, wherein the capacity of the second vessel is no larger than about 50 percent of the capacity of the first vessel.

103. The method of Claim 98, wherein the additional liquid vehicle is added to the second vessel during the generating step.

104. The method of Claim 98, further comprising, prior to the generating step, preparing a batch of the precursor liquid in the first vessel.

105. The method of Claim 104, wherein the method is operated in batch mode with a batch size substantially equal to the batch of the precursor liquid prepared in the first vessel.

106. The method of Claim 104, wherein the batch of the precursor liquid is larger than about 300 liters.

107. The method of Claim 98, further comprising automatically monitoring the level of the precursor liquid in the second vessel and automatically controlling the transfer of the precursor liquid from the first vessel to the second vessel based, at least in part, on the monitored level of the precursor liquid in the second vessel.

108. The method of Claim 98, wherein at least a portion of the precursor liquid effluent from the aerosol generator is received in the second vessel for recycle to the aerosol generator.

109. The method of Claim 77, wherein the volumetric recycle ratio in the precursor liquid supplied to the aerosol generator is larger than about 6.

110. The method of Claim 109, wherein the volumetric recycle ratio is larger than about 8.

111. The method of Claim 109, wherein the volumetric recycle ratio is larger than about 10.

112. The method of Claim 77, wherein the precursor material is in particulate form, and the precursor liquid comprises a suspension of the particulate precursor material in the liquid vehicle.

113. The method of Claim 77, wherein the precursor liquid comprises the precursor material dissolved in the liquid vehicle.

114. The method of Claim 77, wherein the precursor material is a first precursor material and the precursor liquid comprises at least a second precursor material, different than the first precursor material, with at least one of the first precursor material and the second precursor material being dissolved in the liquid vehicle.

115. An automated aerosol method for making particles of a selected composition, the method comprising:

supplying a precursor liquid feed to an aerosol generator at a precursor liquid feed rate, the precursor liquid feed including at least one precursor material and a liquid vehicle;

supplying a carrier gas to the aerosol generator at a carrier gas feed rate;

generating, in the aerosol generator, an aerosol stream including droplets, comprising at least a portion of the precursor liquid feed supplied to the aerosol generator, dispersed in at least a portion of the carrier gas supplied to the aerosol generator;

the precursor liquid feed supplied to the aerosol generator being separated, in the aerosol generator, into at least two portions during the generating step, a first portion exiting the aerosol generator in the droplets of the aerosol stream and a second portion exiting the aerosol generator as precursor liquid effluent, at least a portion of which is recycled as part of the precursor liquid feed to the aerosol generator;

after the generating step, forming the particles in the aerosol stream, comprising heating the aerosol stream;

automatically controlling at least one operating condition selected from the group consisting of the carrier gas feed rate, the precursor liquid feed rate and heat input into the aerosol stream during the heating step, the automatic control of the at least one operating condition being at the direction of an electronic processor, which processes instructions for directing control of the at least one the operating condition for manufacture of the particles of the selected composition.

116. The method of Claim 115, wherein at least two operating conditions selected from the group consisting of the carrier gas feed rate, the precursor liquid feed rate and the heat input are automatically controlled at the direction of the electronic processor.

117. The method of Claim 115, wherein each of the carrier gas feed rate, the precursor liquid feed rate and the heat input are automatically controlled at the direction of the electronic processor.

118. The method of Claim 115, wherein the carrier gas feed rate is automatically controlled at the direction of the electronic processor; and

the carrier gas feed is supplied from a plurality of gas supply lines, each independently supplying a different portion of the carrier gas feed to the aerosol generator, the flow rate of the carrier gas through each of the gas supply lines being independently automatically controlled at the direction of the electronic processor.

119. The method of Claim 115, further comprising, after the step of forming the particles in the aerosol stream, cooling the aerosol stream, comprising mixing into the aerosol stream a cooling gas delivered at a cooling gas feed rate, which cooling gas feed rate is automatically controlled at the direction of the electronic processor.

120. The method of Claim 115, wherein the step of heating the aerosol stream comprises flowing the aerosol stream through a furnace maintained at elevated temperature, heat input into the furnace being automatically controlled at the direction of the electronic processor.

121. The method of Claim 120, wherein the furnace includes a plurality of heating zones, with heat input into each of the heating zones being independently automatically controlled at the direction of the electronic processor.

122. The method of Claim 120, wherein the furnace comprises at least two end caps, one adjacent an entrance end of the furnace and one adjacent on exit end of the furnace;

each said end cap including an internal flow path for circulation of a cooling fluid through at least a portion of the end cap to cool the end cap; and

the electronic processor monitors temperature in the vicinity of at least one of the end caps, which electronic processor is capable of automatically directing flow of the cooling fluid to the end caps in response to the monitored temperature.

123. The method of Claim 115, wherein the aerosol generator comprises an ultrasonic generator including a plurality of ultrasonic transducers underlying a reservoir of the precursor liquid, the plurality of transducers ultrasonically energizing the precursor liquid in the reservoir to form the droplets for generation of the aerosol stream.

124. The method of Claim 115, wherein the aerosol generator comprises an ultrasonic aerosol generator including a plurality of ultrasonic transducers underlying a reservoir of the precursor liquid, the plurality of transducers ultrasonically energizing the precursor liquid in the reservoir during the step of generating an aerosol stream; and

during the step of generating the aerosol stream, a cooling fluid is circulated through at least a portion of the aerosol generator to cool the ultrasonic transducers, flow of the cooling fluid being automatically controlled at the direction of the electronic processor.

125. The method of Claim 115, wherein the aerosol generator comprises an ultrasonic aerosol generator including a plurality of ultrasonic transducers underlying a reservoir of the precursor liquid, the plurality of transducers ultrasonically energizing the precursor liquid in the reservoir during the step of generating an aerosol stream, the ultrasonic transducers being driven by driver circuits; and

during the step of generating an aerosol stream, a cooling fluid is circulated adjacent the driver circuits to cool the driver circuits, with flow of the cooling fluid being automatically controlled at the direction of the electronic processor.

126. The method of Claim 115, wherein, during the step of generating the aerosol stream, the precursor liquid is supplied to the aerosol generator from a liquid supply system including at least two vessels, each including a portion of the precursor liquid, a first vessel having a larger capacity and feeding the precursor liquid to a second vessel, having a smaller capacity, from which the precursor liquid is withdrawn for supply to the aerosol generator;

at least a portion of the precursor liquid effluent from the aerosol generator is recycled to the second vessel, so that the concentration of the precursor material in the precursor liquid contained in the second vessel has a tendency to become more concentrated over time; and

additional liquid vehicle is added to the second vessel to at least partially compensate for the tendency, the addition of the additional liquid vehicle to the second vessel being automatically controlled at the direction of the electronic processor.

127. The method of Claim 126, wherein the electronic processor monitors at least one property of the precursor liquid in the second vessel and responsively directs automatic control of the addition of the additional liquid vehicle.

128. The method of Claim 127, wherein the step of monitoring the at least one property comprises measuring the at least one property in the precursor liquid withdrawn from the second vessel for supply to the aerosol generator.

129. The method of Claim 126, wherein the level of the precursor liquid in the second vessel is automatically controlled at the direction of the electronic processor.

130. The method of Claim 129, wherein the electronic processor monitors the level of the precursor liquid in the second vessel and responsively directs automatic control of transfer of the precursor liquid from the first vessel to the second vessel.

131. The method of Claim 126, wherein supply of the precursor liquid from the second vessel to the aerosol generator is automatically controlled at the direction of the electronic processor.

132. The method of Claim 126, wherein the method is operated in batch mode with the first vessel initially containing a volume of the precursor liquid that defines a batch volume for a batch, the level of the precursor liquid in the first vessel dropping as the step of generating the aerosol stream continues; and

the electronic processor monitors the level of the precursor liquid in the first vessel and automatically activates and directs a shut-down procedure, for terminating the batch, when the level of the precursor liquid in the first vessel drops below a predetermined value.

133. The method of Claim 132, wherein the shut-down procedure comprises deactivating the aerosol generator, purging the aerosol generator with a quantity of the carrier gas, and discontinuing the supply of carrier gas to the aerosol generator.

134. The method of Claim 115, wherein the method is operated in batch mode and the electronic processor automatically activates and directs a start-up procedure for a batch prior to commencement of the step of generating the aerosol stream;

the start-up procedure including circulation of precursor liquid to the aerosol generator and purging the aerosol generator with a purge gas.

135. The method of Claim 134, wherein the purge gas is of substantially the same composition as the carrier gas.

136. The method of Claim 134, wherein, after completion of the start-up procedure, the electronic processor automatically activates the aerosol generator to commence the step of generating the aerosol stream.

137. The method of Claim 115, wherein the electronic processor comprises a microprocessor or a computer.

138. The method of Claim 115, wherein the electronic processor includes computer-readable memory having the instructions stored therein.

139. An aerosol method for making particles, involving conditioning of equipment prior to particle manufacture, the method comprising:

circulating a precursor liquid to an aerosol generator;

supplying a carrier gas to the aerosol generator;

generating, in the aerosol generator, an aerosol stream including droplets dispersed in at least a portion of the carrier gas supplied to the aerosol generator, during the generating step, a first portion of the circulating precursor liquid being converted to the droplets of the aerosol stream, and a second portion of the circulating precursor liquid being withdrawn from the aerosol generator as effluent for recirculation to the aerosol generator;

forming the particles in the aerosol stream, comprising heating the aerosol stream in an aerosol heater;

wherein, prior to commencement of the generating step, the aerosol heater is subjected to conditioning, comprising flowing a conditioning gas, substantially in the absence of an aerosol, through the aerosol heater at elevated temperature.

140. The method of Claim 139, further comprising, prior to commencement of the generating step, conditioning the aerosol generator by circulating the precursor liquid through the generator, substantially without generating an aerosol.

141. The method of Claim 140, wherein the step of conditioning the aerosol generator comprises heating the circulating precursor liquid, so that the circulating precursor liquid heats at least a portion of the aerosol generator.

142. The method of Claim 141, wherein the step of heating the circulating precursor liquid lasts at least until the temperature of circulating precursor liquid exiting the aerosol generator equals a predetermined elevated temperature.

143. The method of Claim 140, wherein the circulating precursor liquid fills a reservoir volume in the aerosol generator that overlies a plurality of ultrasonic transducers, the ultrasonic transducers being substantially not activated during the step of conditioning the aerosol generator, and the ultrasonic transducers being activated during the step of generating the aerosol stream.

144. The method of Claim 139, wherein, after the step of forming the particles, the temperature of the aerosol stream, including the particles, is reduced in an aerosol cooler; and

during the step of conditioning the aerosol heater, the conditioning gas exits the aerosol heater at an elevated temperature and flows through the aerosol cooler.

145. The method of Claim 144, wherein, after the aerosol stream is cooled in the aerosol cooler, the aerosol stream flows to a particle collector, where the particles are removed from the aerosol stream; and

during the step of conditioning the aerosol heater, the conditioning gas flows to the particle collector to heat at least a portion of the particle collector, so that the particle collector is at an elevated temperature prior to the step of generating the aerosol stream.

146. The method of Claim 145, wherein, in the aerosol cooler, a cooling gas is mixed with the conditioning gas to reduce the temperature of the conditioning gas prior to introduction of the conditioning gas into the particle collector.

147. The method of Claim 139, wherein the step of conditioning the aerosol heater comprises increasing the temperature within the aerosol heater to an elevated temperature prior to flowing the conditioning gas through the aerosol heater.

148. The method of Claim 147, wherein the aerosol heater comprises at least two end caps, one adjacent a flow entrance end of the aerosol heater and one adjacent a flow exit end of the aerosol heater, for connecting the aerosol heater to flow conduits for conducting flow into and away from the aerosol heater; and

during the step of increasing the temperature within the aerosol heater to an elevated temperature, the at least one of the end caps is cooled to remove heat from at least one end cap.

149. The method of Claim 148, wherein cooling the at least one end cap comprises circulating a cooling fluid through a cooling conduit extending through at least a portion of at least one end cap.

150. The method of Claim 139, wherein the conditioning gas is of substantially the same composition as the carrier gas.

151. The method of Claim 139, further comprising, after the step of heating the aerosol stream, reducing the temperature of the aerosol stream in an aerosol cooler, and after the step of reducing the temperature, collecting the particles from the aerosol stream in a particle collector;

a flow path for the aerosol stream including the aerosol generator, the aerosol heater, the aerosol cooler, the particle collector and flow conduits that conduct flow of the aerosol stream between the aerosol generator and the aerosol heater, between the aerosol heater and the aerosol cooler and between the aerosol cooler and the particle collector; and

prior to the step of generating the aerosol stream, the flow path is pressure tested for the presence of leaks.

152. The method of Claim 151, wherein the step of pressure testing the flow path for the presence of leaks is a first pressure test conducted prior to the step of conditioning the aerosol heater; and

the flow path is subjected to a second pressure test conducted after the step of conditioning the aerosol heater and prior to the step of generating the aerosol stream.

153. An aerosol method for making particles, the method comprising:

circulating a precursor liquid to an aerosol generator;

supplying a carrier gas to the aerosol generator;

generating, in the aerosol generator, an aerosol stream including droplets dispersed in at least a portion of the carrier gas supplied to the aerosol generator, in the aerosol generator, a first portion of the circulating precursor liquid being converted to the droplets of the aerosol stream and a second portion of the circulating precursor liquid exiting the aerosol generator as a precursor liquid effluent for recirculation to the aerosol generator;

forming particles in the aerosol stream, comprising heating the aerosol stream in a furnace;

the furnace having a longitudinal direction substantially in the direction of flow of the aerosol stream through the furnace;

wherein, the furnace has a plurality of heating zones, with at least two of the heating zones being positioned to oppose each other in a direction substantially perpendicular to the longitudinal direction, the heat input into a first of said two opposing heating zones being larger than the second heat input into a of said two opposing heating zones.

154. The method of Claim 153, wherein the longitudinal direction extends in a direction having a horizontal component, and at least a portion of the first heating zone is located vertically below the second heating zone.

155 The method of Claim 154, wherein the longitudinal direction extends substantially horizontally, and said first heating zone is located substantially vertically below the second heating zone.

156. The method of Claim 153, wherein, the higher heat input into the first heating zone relative to the second heating zone causes the aerosol stream flowing through the furnace to move in a direction away from the first heating zone and toward the second heating zone.

157. The method of Claim 153, wherein the furnace is a tube furnace and the first heating zone comprises a bottom portion of the tube extending in the longitudinal direction and

the second heating zone comprises a top portion of the tube extending in the longitudinal direction.

158. The method of Claim 157, wherein the higher heat input into the first heating zone relative to the second heating zone causes dispersed particles or droplets in the aerosol stream to move away from the bottom portion of the tube and toward the top portion of the tube.

159. An aerosol method for making particles, the method comprising:

generating, in an aerosol generator, an aerosol stream comprising droplets of a precursor liquid dispersed in a carrier gas;

conducting the aerosol stream from the aerosol generator to an aerosol heater, comprising flowing the aerosol stream through a conduit located between the aerosol generator and the aerosol heater; and

forming the particles in the aerosol stream, comprising heating the aerosol stream in the aerosol heater;

wherein, at least a portion of the conduit is cooled during step of conducting the aerosol stream from the aerosol generator to the aerosol heater.

160. The method of Claim 159, wherein the conduit has a first conduit portion conducting flow of the aerosol stream in a first direction and a second conduit portion directing flow of the aerosol stream in a second direction, the first conduit portion being upstream from the second conduit portion, the step of cooling comprises cooling the first conduit portion.

161. The method of Claim 160, wherein, the temperature of the aerosol stream in the first conduit portion is maintained a temperature low enough so that the dispersed phase in the aerosol stream flowing through the first conduit portion is maintained substantially in a droplet form; and

the temperature of the aerosol stream in the second conduit portion is maintained at a temperature that is high enough so that at least a portion of the disperse phase in the aerosol stream in the second conduit portion is in particulate form.

162. The method of Claim 160, wherein the first conduit portion and the second conduit portion are separated by a bend in the conduit.

163. The method of Claim 162, wherein the bend comprises at least about a 90° change in the direction of flow from the first direction to the second direction.

164. The method of Claim 160, wherein the first direction is substantially vertical and the second direction is substantially horizontal.

165. The method of Claim 160, wherein the step of cooling the first conduit portion comprises directing a cooling gas at an exterior surface of the first conduit.

166. The method of Claim 160, wherein the second conduit portion is substantially not cooled.

5